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Fibre-Based Broadband Black Light Source (Invited paper)

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Abstract.

Black-Light or Wood's lamp refers to sources that emit long-wavelength ultraviolet radiation (UV-A) from 315 nm and little visible light till 410 nm (blue). In this paper, we present a new fibre-based source of "black light", a source that emits broadband ultraviolet radiation but only small amounts of visible light and no infrared light. We made this source by pumping a specially designed silica photonic crystal fibre (PCF) with 355 nm light pulses from a Q-switched frequency-tripled Nd:YAG laser. Four-wave mixing and cascaded Raman generation combine in the fibre to provide a supercontinuum output that spans from around 350 nm to 390-470 nm, with the exact spectral width dependent on the pump power, as shown in Fig. 1. This broadband black-light source can find potential applications for diagnostic and therapeutic uses in medicine and in dermatology, for the detection of substances tagged with fluorescents and minerals, for counterfeit money, for absorption spectroscopy, and for military applications [1,2].

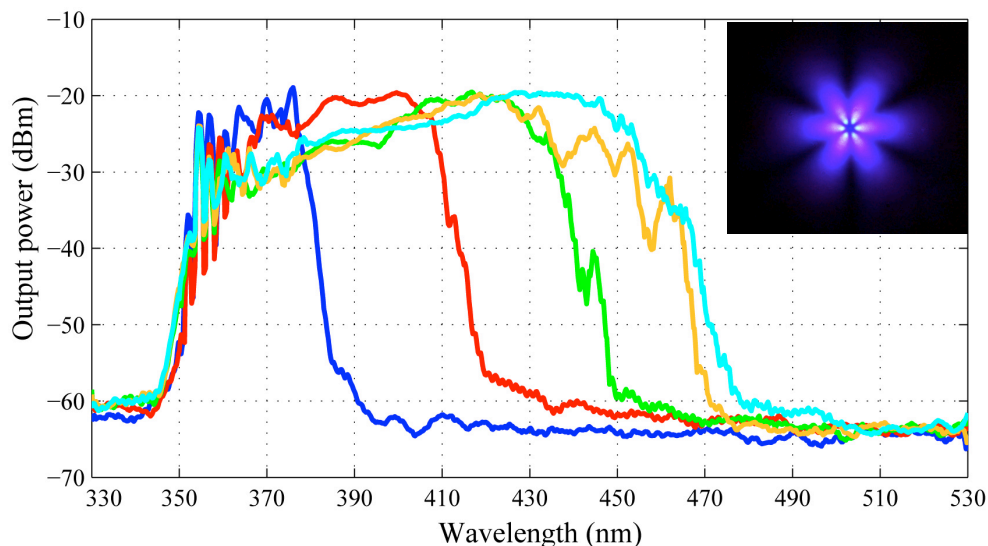


Fig. 1. Output spectra for increasing input power from 0.5 to 4 mW showing black-light continuum generation from 350 nm up to the blue at 470 nm in a 30 m-long silica PCF pumped at 355-nm with 300-ps Q-switched pulses. The inset shows the optical mode output.

References

- [1] T. Sylvestre *et al.* "Black-light continuum generation in a silica-core photonic crystal fiber," Opt. Lett. **37**, 130-132 (2012).
- [2] O. Graydon, Nature Photonics **6**, 138 (2012).